NEMS CLARKE EQUIPMENT

INSTRUCTION BOOKLET

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PCM-301 PHASE COMPARATOR MODULE

The PCM-301 Phase Comparator Module is designed for receivers having phase demodulation capabilities. The PCM-301 performs the actual video demodulation. A block diagram of the module is shown in figure 1. The PCM-301 functions in conjunction with the receiver's tracking loop module, the voltage-controlled oscillator (second l-o), and the phase tracking demodulator to provide the phase demodulation capabilities for the receiver.

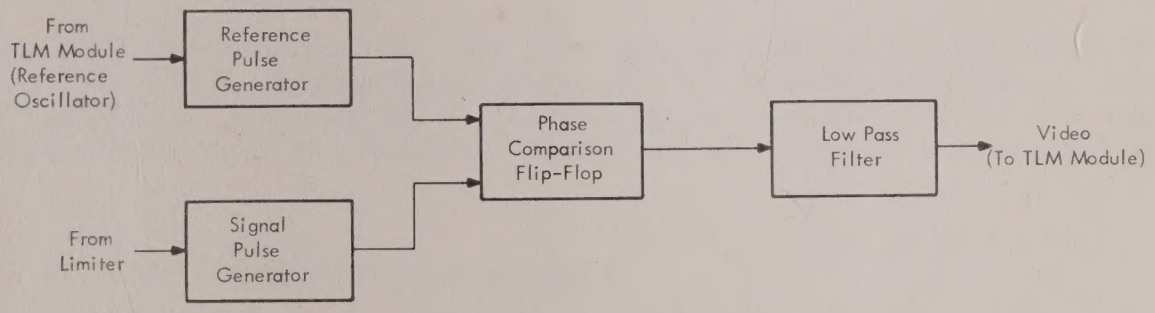

Figure 1. Functional Block Diagram

The PCM-301 is more linear (to ±140°) and has much wider frequency response than the loop phase detector, located in the tracking loop module. In essence, the PCM-301 compares the instantaneous zero crossings between the reference signal and the second i-f signal. The time displacement between the two signals varies according to the degree of modulation present on the second i-f signal. An instantaneous dc voltage, proportional to this time difference, is derived from the signal comparison. After the signal is averaged by an integrating network, the resultant voltage becomes the video output.

The two input signals to the PCM-301 are the 10 mc reference (from the tracking loop module) and the 10 mc second i-f (from the receiver's limiter module) at J1. When the phase loop is locked with no modulation present, these two input signals are initially in phase at the input to this module. Amplifier Q1 provides a 180° phase reversal of the 10 mc i-f signal before comparison. The pulse generators, Q2 and Q7,

each furnish a narrow positive-going pulse simultaneously with each negative-going zero-axis crossing of their respective input signals. These pulses, after inversion by the trigger circuits Q3 and Q6, switch the state of the flip-flop Q4 and Q5. The output signal from the flip-flop is applied from the base of Q4 to the base of Q8. Q8 and Q9 comprise a limiting circuit to square-up the flip-flop output pulses. With no modulation present and the phase tracking loop locked, the on and off times of Q9 are identical and the resultant output of the dc averaging network C10, C11, C12, and L4 is zero.

With phase modulation present on the second i-f signal, its zero-axis crossing times vary with respect to the reference signal and the on and off time of Q9 is no longer identical. This results in a video output signal directly proportional to the phase modulation.

ALIGNMENT

The PCM-301 has only one variable component, L6. This adjustment is made in conjunction with the alignment of the Tracking Loop Module Circuitry. The adjustment of L6, and consequently, the alignment of the PCM-301, is included in the alignment procedures for the Tracking Loop Module and the overall receiver.

ELECTRICAL PARTS LIST

Reference Designation	Description
C1 through C8	Capacitor, ceramic, 0.01 uF +80-20%, 50V, Sprague 19C214
C9	Capacitor, monolytic, 1.0 uF ±20%, 25V, Sprague 5C13
C10	Capacitor, mica, 100 pF ±5%, 500V, Elmenco DM15F101J03
C11	Capacitor, ceramic, 5.6 pF ±0.25 pF, 500V, R1CC22C0H569C
C12	Capacitor, mica, 100 pF ±5%, 500V, Elmenco DM15F101J03
C13	Capacitor, mica, 390 pF ±5%, 500V, Elmenco DM15F391J03
C14	Capacitor, mica, 680 pF ±5%, 500V, Elmenco DM15F681J
C15	Capacitor, mica, 680 pF ±5%, 500V, Elmenco DM15F681J
CR1	Diode, Fairchild FD824
CR2	Diode, zener, 1N709A
CR3	Diode, zener, 1N709A
CR4	Diode, Fairchild FD824

Reference Designation	Description
J1 through J3	Jack, bulkhead, Microdot 31-33
L1	Choke, rf, 15 uH ±10%, Essex WEE-15
L2	Choke, rf, 0.68 uH ±10%, Wilco 201-11-68
L3	Choke, rf, 1.0 uH ±10%, Essex WEE-1.0
L4	Choke, rf, 47 uH ±10%, Essex WEE-47
L5	Not assigned
L6	Coil, variable,
P1	Connector, plug, DCM-8W8P
P2	Connector, plug, DCMF-13W6P
Q1 through Q9	Transistor, Sylvania 2N708
R1	Resistor, composition, fixed, 51Ω ±5%, 1/4W, RC07GF510J
R2	Resistor, composition, fixed, 3.3k ±5%, 1/4W, RC07GF332J
R3	Resistor, composition, fixed, 6.8k ±5%, 1/4W, RC07GF682J
R4	Resistor, composition, fixed, 680Ω ±5%, 1/4W, RC07GF681J
R5	Resistor, composition, fixed, 2.2k ±5%, 1/4W, RC07GF222J
R6	Resistor, composition, fixed, 560Ω ±5%, 1/4W, RC07GF561J
R7	Resistor, composition, fixed, 220Ω ±5%, 1/4W, RC07GF221J
R8	Resistor, composition, fixed, 6.8k ±5%, 1/4W, RC07GF682J
R9	Resistor, composition, fixed, 47Ω ±5%, 1/4W, RC07GF470J
R10	Resistor, composition, fixed, 1k ±5%, 1/4W, RC07GF102J
R11	Resistor, composition, fixed, 1k ±5%, 1/4W, RC07GF102J
R12	Resistor, composition, fixed, 470Ω ±5%, 1/4W, RC07GF471J
R13	Resistor, composition, fixed, 1k ±5%, 1/4W, RC07GF102J

Reference Designation	Description
R14	Resistor, composition, fixed, 1k ±5%, 1/4W, RC07GF102J
R15	Resistor, composition, fixed, 220Ω ±5%, 1/4W, RC07GF221J
R16	Resistor, composition, fixed, 220Ω ±5%, 1/4W, RC07GF221J
R17	Not assigned
R18	Resistor, composition, fixed, 47Ω ±5%, 1/4W, RC07GF470J
R19	Resistor, composition, fixed, 220Ω ±5%, 1/4W, RC07GF221J
R20	Resistor, composition, fixed, 560Ω ±5%, 1/4W, RC07GF561J
R21	Resistor, composition, fixed, 22Ω ±5%, 1/4W, RC07GF220J
R22	Resistor, composition, fixed, 22Ω ±5%, 1/4W, RC07GF220J
R23	Resistor, composition, fixed, 470Ω ±5%, 1/4W, RC07GF471J
R24	Resistor, composition, fixed, 2.2k ±5%, 1/4W, RC07GF222J
R25	Resistor, composition, fixed, 1k ±5%, 1/4W, RC07GF102J
R26	Resistor, composition, fixed, 680Ω ±5%, 1/4W, RC07GF681J
R27	Resistor, composition, fixed, 51Ω ±5%, 1/4W, RC07GF510J
R28	Not assigned
R29	Not assigned
R30	Resistor, composition, fixed, 51Ω ±5%, 1/4W, RC07GF510J
TP1	Connector, test jack, green, Ucinite 119437

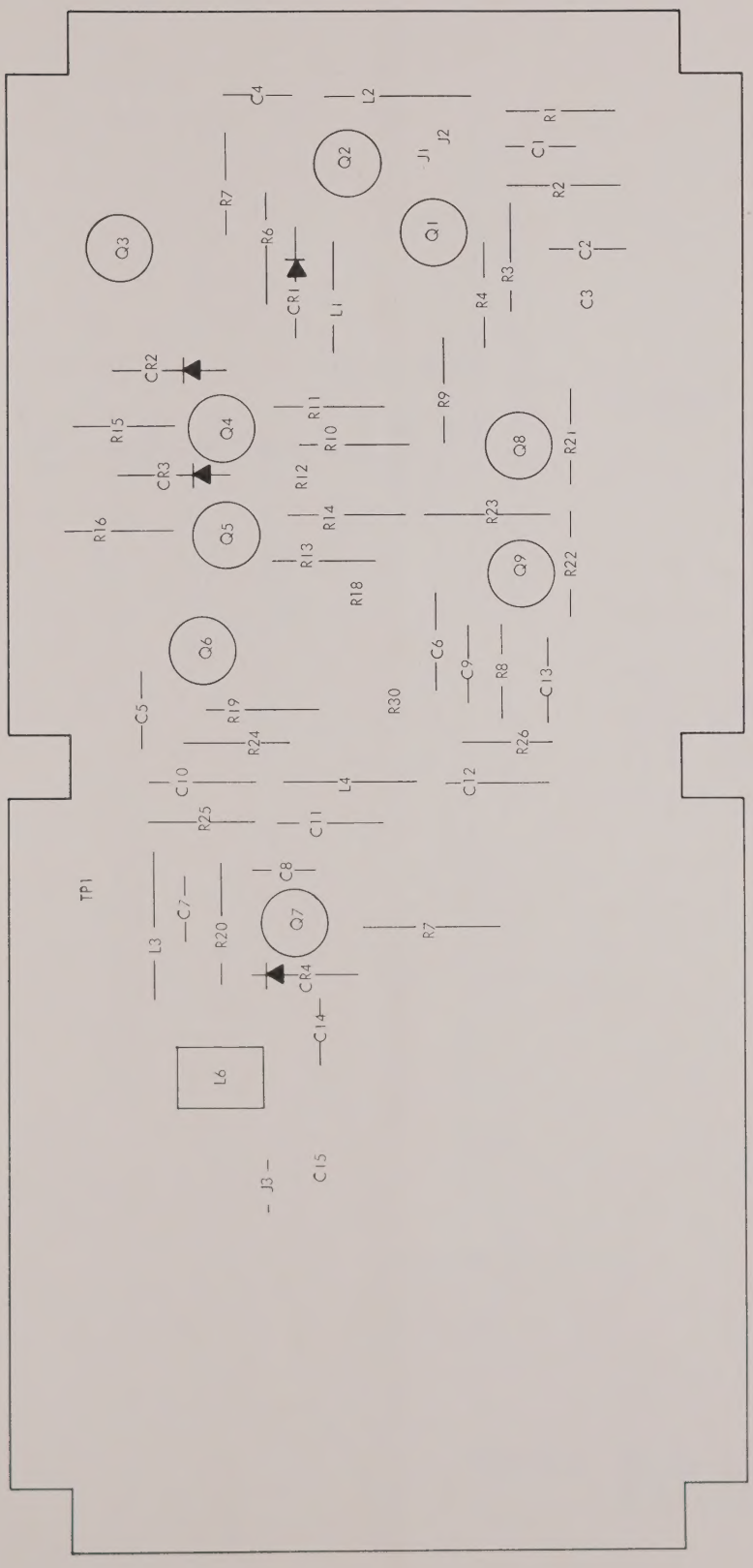

Figure 2. Component Location Drawing

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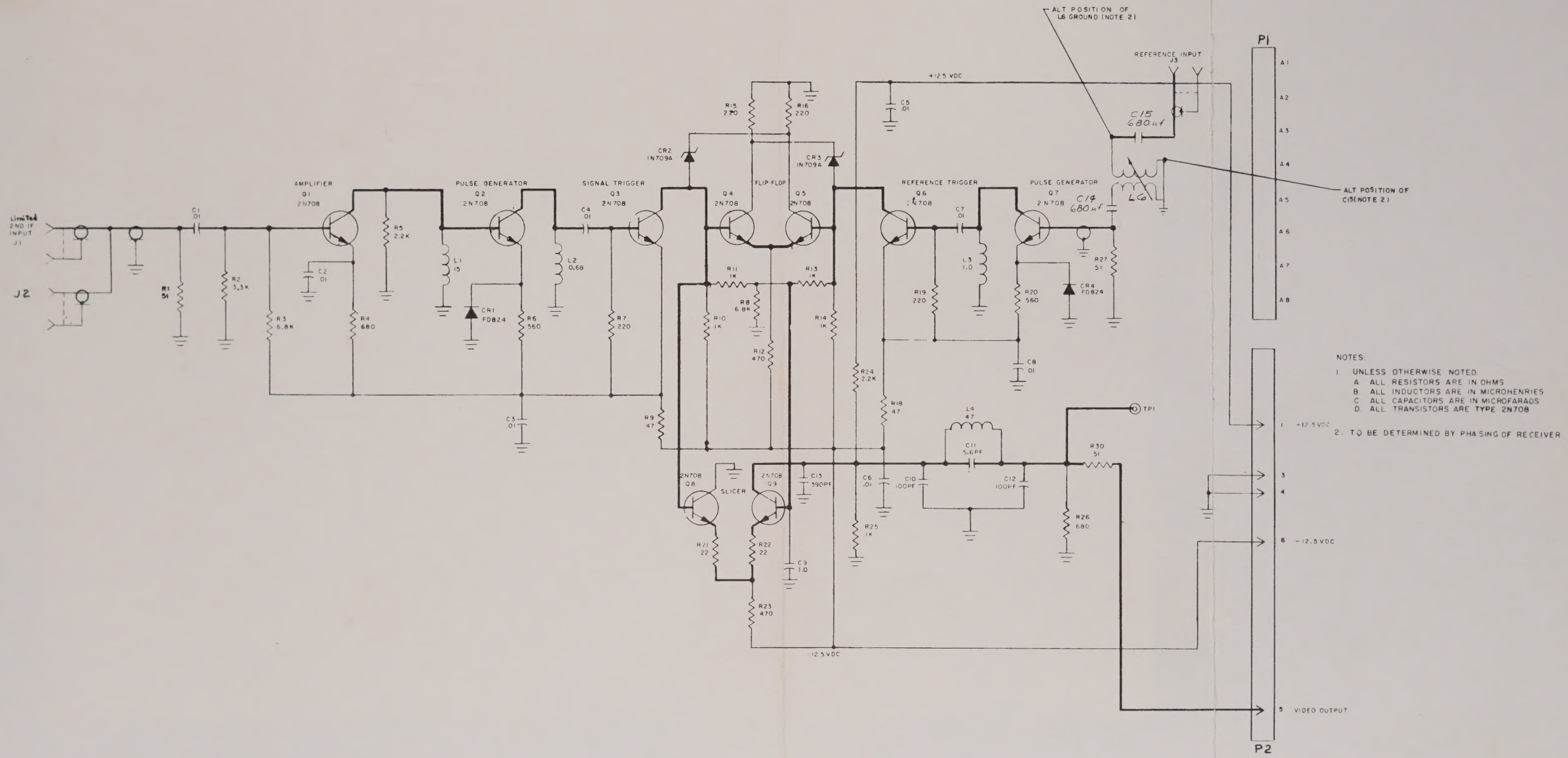

Figure 3. Phase Comparator Module, Schematic Diagram 301198A

Phase Mod. Sensitivity $= \frac{\Delta \Phi}{V_m} = \frac{\Delta F}{F_m V_m}$ radians/volt

or, conversely : $\frac{F_m V_m}{\Delta F}$ volts/radian

where : ΔF = max. freq. deviation

" F_m = freq. of modulating Signal

" V_m = amplitude (volts) of modulating Signal.